COMPARISON OF TWO WELSH SAND DUNE FAUNAS WITH SPECIAL REFERENCE TO THE COLLEMBOLA

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An investigation of terrestrial sand dune fauna at Ynyslas, Cardiganshire (Miles 1984) a site managed for its scientific interest by the Nature Conservancy Council, prompted investigations of two sand dunes that have not been previously studied: one at Gwbert-on-Sea in south Cardiganshire, the other at Manorbier in Pembrokeshire.

The dunes at Gwbert-on-Sea (SN162489) are situated at the mouth of the Afon Teivi flowing into Cardigan Bay. On the north side of the estuary at Gwbert-on-Sea the stable dune used for a permanent caravan site restricted the area available for investigation. This dune is not subject to extensive wind erosion or excessive public pressure but at spring tides, especially when gale force south westerly winds drive heavy seas ashore, there is some cutting back of the dune escarpment, but within 16 m from this high water mark fixed dune commences.

Manorbier dune (SM061974) in south Pembrokeshire, dominated by Manorbier Castle, is largely a mature dune system that almost fills the small bay. A small stream trickles onto the beach. There is little erosion or disturbance as much of the area is dune scrub.

A similar pattern of arthropod distribution was found to occur in the component ecological zones at Gwbert-on-Sea and Manorbier, as well as at Ynyslas previously studied.

The arthropod fauna at Gwbert-on-Sea in terms of number of specimens is smaller by about half compared with Ynyslas, but with 15 species, is similar in this respect, Manorbier having most with some 22 species.

The botanical associations at Gwbert-on-Sea and Manorbier are similar in that early scrub commences about 48 m beyond high water.

Excluding plantless areas of blown sand, from evidence so far obtained the number of species of Collembola present in zones colonized by plants appears to be unrelated to the number of botanical species present and rather surprisingly, little if any difference could be detected in the number of species present in wet dune areas, and drier dune scrub in winter months. However, the density of ground cover such as provided by the presence of grasses, mosses, etc, resulted in a small increase in the number of Collembola species present.

In south Wales, dunes facing Atlantic waves have only small numbers of Collembola, the dominant order. Collembola were found to occur to within 16 m of high water. Sand dunes are deficient in organic matter and lack most horizons usually found in inland soil structure, resulting in small populations of only a few species however, a litter layer develops in the dune scrub zone.

The Collembola of these dunes represent a broad cross-section of this order, embracing representatives of soil-dwelling, surface-inhabiting and arboreal species, these last being usually furthest from the shore. The soil-dwelling 'pioneer' species of a primary zone of almost pure sand are *Mesaphorura krausbaueri* (Börner) and *Protaphorura armatus* (Tullberg). The most abundant of the surface dwelling species to be found in the dunes and of general distribution are *Isotoma notabilis* (Schäffer) and *Pogonognathellus longicornis* (Müll.).

Species	Gwbert				Manorbier			
Zone:	A	B	C	D	A	B	C	D
ISOPODA								
Armadillidium vulgare (Latr.)							21	
Philoscia muscorum (Scop.)							2	1
Porcellio scaber (Latr.)							5	
Metonoponorthus cingendus (Kinahan)							3	
PSEUDOSCORPIONIDA								
Roncus lubricus (L.Koch)							1	
ACARINA								
Oribatidae							6	1
Trombidiidae						1		
Trombidium holosericum (L.)		1						
ARANEAE								
Linyphiidae								1
SYMPHYLA								
Symphylellopsis subnuda (Hansen)				1				
COLLEMBOLA								
Ceratophysella armata (Nic.)							1	
Friesea mirabilis (Tullb.)			7	15		3	23	28
Neanura muscorum (Templ.)				3		1		1
Onychiuridae			1					
Protaphorura sp.							12	5
Protaphorura armatus (Tullb.)			36	67	1	76	144	59
Tullbergia sp.							1	
Metaphorura ? affinis Börn.								3
Stenaphorura quadrispina (Börn.)			1					
Mesaphorura callipygos Börn.								3
M.krausbaueri (Börn.)		21	213	18		11	49	163
Isotomiella minor (Schäff.)								1
Cryptopygus thermophila (Axels.)		2	6	5			9	39
Isotominae							1	
Isotoma sp.						1	14	2
I.notabilis Schäff.		14		32		1	101	31
I.olivacea Tullb.				12				
I.viridis Bourl.			20	11		11	75	1
Isotumurus palustris (Müll.)				1			1	7
Entomobrya sp.			1	2		1	2	1
E.albocincta (Templ.)								1
E.lanuginosa (Nic.)								5
E.multifasciata (Tullb.)	1	3		2				5
E.nivalis (L.)			14	10				7
Lepidocyrtus sp.							1	
L.cyaneus (Tullb.)							1	1
Willowsia nigromaculata (Lubb.)								3
Orchesella cincta (L.)		1						
O.villosa (Geoff.)				1	1	1	1	5
Tomocerus sp.						2		1
T.minor (Lubb.)							4	
Pogonognathellus longicornis (Müll.)			10	68			19	12
SYMPHYPLEONA								
Neelus minimus (Willem)				1				
Sminthurinus aureus (Lubb.)								2
Sminthurus viridis (L.)							2	
Dicyrtoma minuta (F.)			4	1			9	1
D.ornata (Nic.)								3
Indet. (damaged/moulting)						3	1	3

Species	Gwbert				Manorbier			
Zone:	A	B	C	D	A	B	C	D
HEMIPTERA								
Aploneura lentisci Pass.			2					
COLEOPTERA								
Trechus obtusus Er.			2					
Amara aenea (DeG.)							6	
A. lucida (Duft.)							1	
Dromius linearis (Ol.)			1					
Sphaeridium bipustulatum F.							1	1
Megasternum obscurum (Marsh.)							1	
Bledius longulus Er.			4					
Stenus clavicornis (Scop.)			3					
S.flavipes Steph.			1					
Xantholinus linearis (Ol.)							1	1
X. longirostris Heer							1	
Philonthus cognatus Steph.								21
P. varius (Gyll.)								1
Staphylinid (larva)							1	
Tachyporus atriceps Steph.							1	
T. chrysomelinus (L.)							1	1
T. hypnorum (F.)							9	4
T. nitidulus (F.)							2	
T. solutus Er.							1	
Atheta S. Philhygra ?volans. (Scrib.)								1
Chaetocnema hortensis (F.)							1	
Hypera nigrirostris (F.)			1				2	

Mollusca, while present at Gwbert-on-Sea are 'small' species and few in numbers compared with Manorbier which provided a surprising number mostly represented by empty shells, suggesting an accumulation of several years. These species were not found at Ynyslas. Mollusca were recorded for the Biological Records Centre, but are not included in this account.

Coleoptera, only found occurring in zones of mature dune and dune scrub, were all below the soil surface, inactive in a state of hibernation at the time of sampling. Of 17 species obtained, only six were recorded at Gwbert-on-Sea, one species *Bledius longulus* Er. is local, this species is known elsewhere associated with inland sand-pits and cliffs, and *Trechus obtusus* Er. in damp places, stream sides and river banks. At Manorbier *Amara lucida* Duft. was found. This is a chiefly coastal species and the rarely seen *Xantholinus longiventris* Heer was obtained, the remaining species recorded from the dunes are commonly met with and are not particularly associated with coastal dunes.

No rare or unusual plant species were observed at Gwbert-on-Sea or at Manorbier and a few mites, symphyla and woodlice were not of special interest or specific to coastal sand dunes except *Metonoponotus cingendus* (Kinahan).

These studies were achieved by means of 25-cm quadrats spaced at 8-m intervals along a line transect through the major divisions of dune formation from west to east. At Gwbert-on-Sea the transect extended from high water mark to the frontage of the nearest block of caravans. Organisms were extracted by floatation. Samples were taken at the end of January at a time when many Collembola are more numerous than during hot dry summer months.

There having been no previous analysis of terrestrial arthropoda of these dunes a species list is appended with relevant details of zones and dominant plant species.

Gwbert-on-Sea. Zone A, blown sand, nil; zone B, embryo dune, *Festuca ovina* L. and *Poa pratensis* L.; zone C, mature dune, *Festuca ovina* L. *Agropyron* sp. and *Dactylis glomerata* L.; zone D, dune scrub, *Rosa pimpinellifolia* L. (dense root mat), *Rubus fruticosus* L., *Festuca ovina* L., *Ammophila arenaria* (L.).

Manorbier. Zone A, blown sand, nil; zone B, embryo dune, *Ammophila arenaria* (L.), and *Festuca ovina* L.; zone C, mature dune, *Hedera helix* L., *Festuca* sp. and *Pteridium aquilinum* (L.); zone D, dune scrub, *Rubus fruticosus* L., *Hedera helix* L., *Pteridium aquilinum* (L.).

Reference

Miles, P.M. 1984. Terrestrial sand-dune fauna at Ynslas, Cardiganshire. *Nature in Wales* New Series 2. Parts 1 and 2 (for 1983): 75–79.

BOOK REVIEW

Tiger beetles/ground beetles: illustrated key to the Cicindelidae and Carabidae of Europe. Jürgen Trautner and Katrin Geigenmuller. Gaimersheim, Josef Margraf, 1987, 488 pages, DM 98 (cased) and DM69 (paperback).

This is a most unusual book. Written in German and English (with a German accent), it is completely bilingual. After a short introduction (left-hand columns German, right-hand columns English) and some superb colour photographs from life, begin the illustrated keys (left-hand pages German, right-hand pages English). And illustrated they are; profusely and clearly, 1200 excellent line drawings of whole insects or important characters. Liberally sprinkled amongst these is a number of distribution maps (usually about one per genus). The area covered by the book is all Europe excluding Turkey, the Soviet Union and the eastern parts of Bulgaria and Rumania. An illustrated key to *all* the tiger and ground beetles of *all* Europe would be rather a grand claim — and sure enough this is not entirely the claim made. Although many genera are keyed down to species many parts of the key extend only to genus (mainly the smaller beetles such as *Dyschirius*, *Trechus*, *Tachys* etc) or subgenus (*Bembidion* etc), and the vast conglomerate of the blind Trechini are merely listed and are not keyed out separately. Some genera although keyed to species, cover only those from certain parts of Europe. For some of the larger genera like *Carabus*, *Nebria*, *Pterostichus* and *Harpalus*, the key is only valid for various permutations of Central Europe (as in Freude, Harde and Lohse), Scandinavia, Northern France and the UK. It is usually the more species-rich Mediterranean which is left out. Despite these shortcomings, the book is interesting and useful and so far I have found it thoroughly engrossing and entertaining. The English is understandable and the bilinguality will certainly help coleopterists (myself included) to come to terms with some entomological German, however the grammar is often peculiar and highly amusing. The book will certainly 'easen' the identification of the carabids of the whole of Europe, and it well repays the close collaboration of the authors (and their rat!) with the publisher Josej Margraf in his publishing house. I certainly recommend the book, my only misgiving being the rather unaesthetic plasticized cover — perhaps though, this makes it the ideal book to dip into in the bath!

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